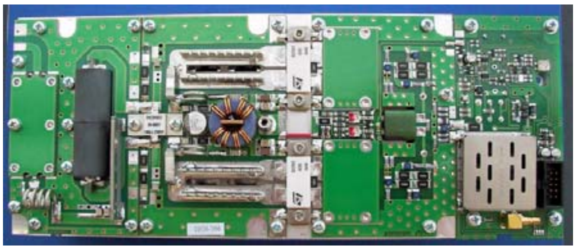
# STEVAL-TDR010V1

## RF power amplifier demonstration board using: 2 x SD2942 N-channel enhancement-mode lateral MOSFETs

## Features

- Excellent thermal stability
- Frequency: 87.5 - 108 MHz
- Supply voltage: 48 V
- Output power: 700 W min.
- Gain: 19.5 dB min.
- Efficiency: 73 % min.
- Harmonics < - 36 dBc
- Gain flatness: ± 0.5 dB max



AM01227v1

## Description

The STEVAL-TDR010V1 is a RF broadband power amplifier intended for FM broadcast radio transmitters over the band 87.5 to 108 MHz using 2 x SD2942 gold metallized N-channel MOS field-effect transistors.

STEVAL-TDR010V1 is designed in cooperation with InnovAction s.r.l in italy.

**Table 1. Device summary**

| Order code |
|---|
| STEVAL-TDR010V1 |

# Contents

# 1 Electrical data

## 1.1 Maximum ratings

**Table 2. Absolute maximum ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $P_{IN}$ | Input power | 15 | W |
| $P_{OUT}$ | Output power | 800 | W |
| $T_{STG}$ | Storage temperature range | -20 to +70 | °C |
| $T_C$ | Operating base plate temperature | 0 to +70 | °C |
| $I_{DD}$ | Drain current | 22 | A |
| $P_{DISS}$ | Power dissipation | 400 | W |

# 2 Electrical characteristics

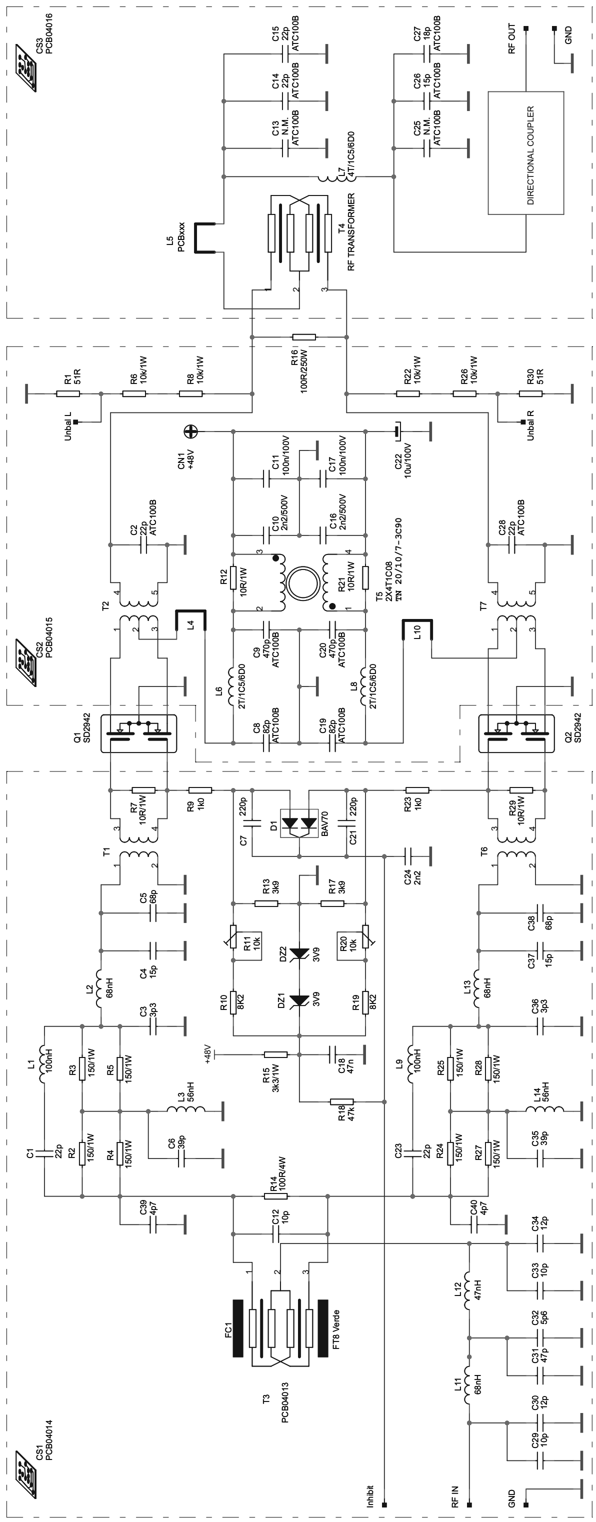
$T_A$ = +25 °C, $V_{DD}$ = 48 V, $I_{dq}$ = 2 x 200 mA

**Table 3. Electrical specification**

| Symbol | Test conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Frequency | Frequency range | 87.5 | | 108 | MHz |
| $P_{OUT}$ | | 700 | | 750 | W |
| Gain | $P_{OUT}$ = 700 W | | 20 ± 1.0 | | dB |
| ND | $P_{OUT}$ = 700 W | | 80 | | % |
| H2 | $2^{nd}$ harmonic @ $P_{OUT}$ = 700 W | | -40 | | dBc |
| H3 | $3^{rd}$ harmonic @ $P_{OUT}$ = 700 W | | -45 | | dBc |
| FL | Gain flatness @ $P_{OUT}$ = 700 W | | | ± 0.5 | dB |

# 3 Circuit schematic

**Figure 1. RF amplifier module**



AM02105v1

## Figure 2. Input and protection board

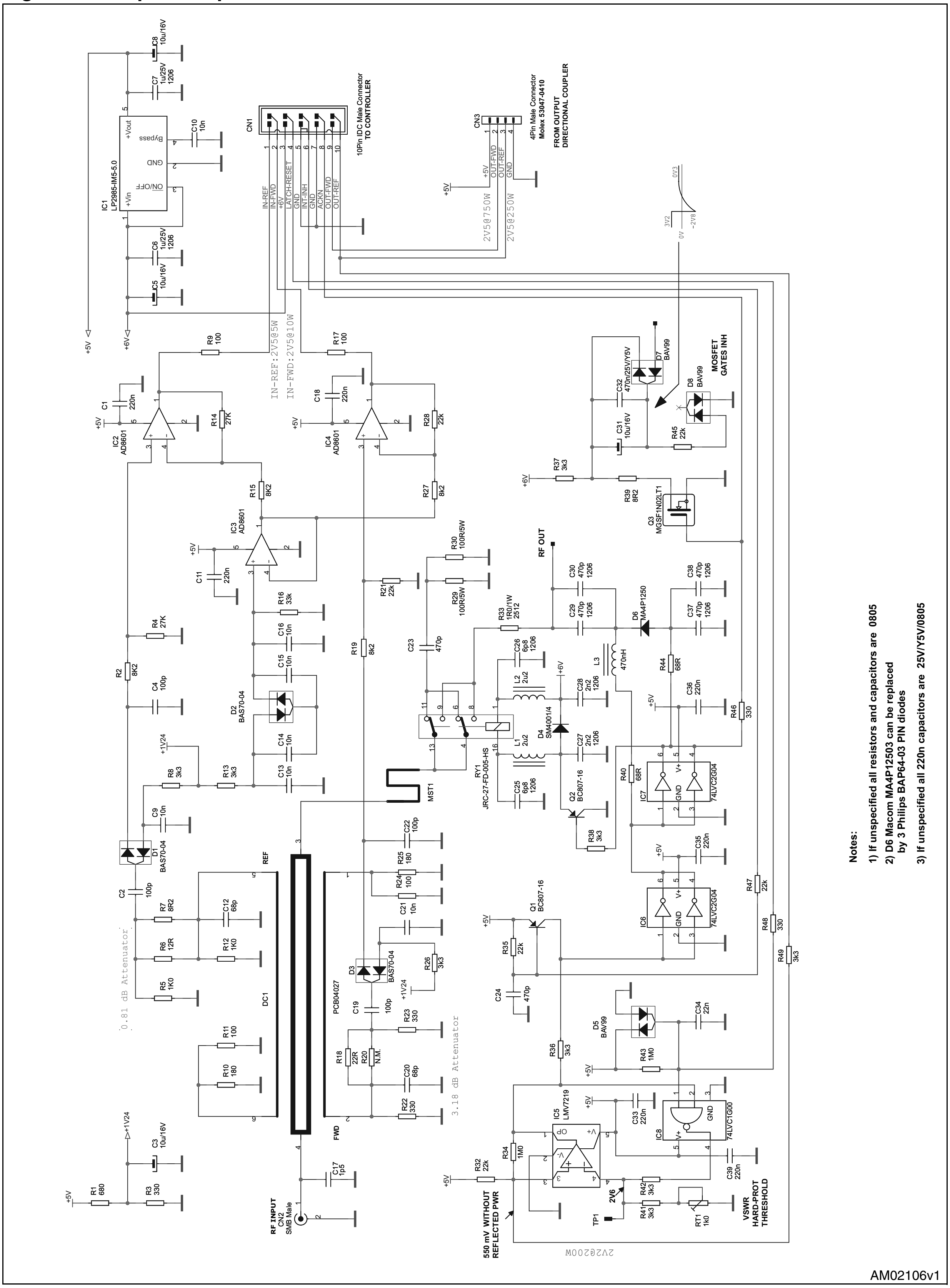
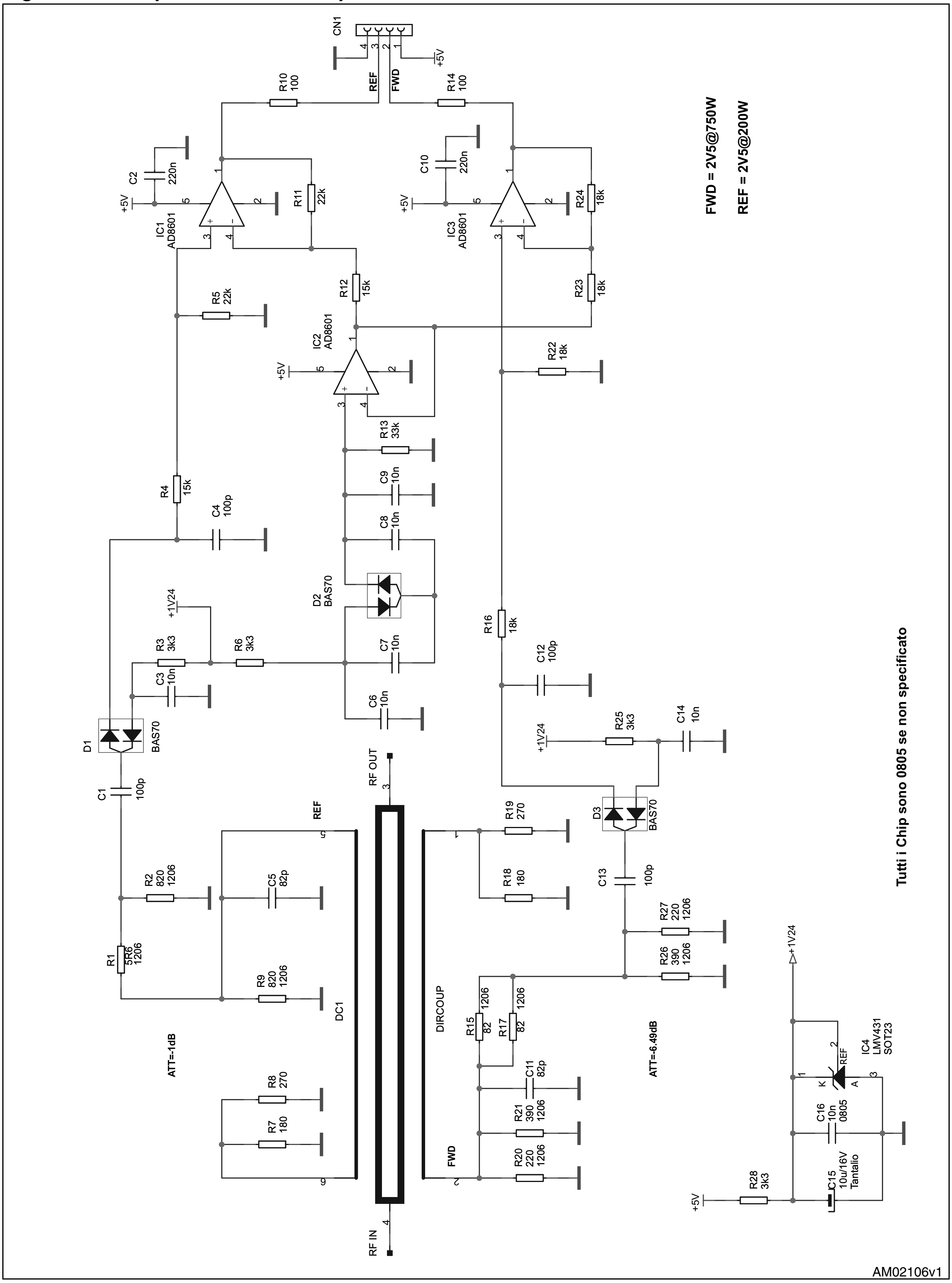
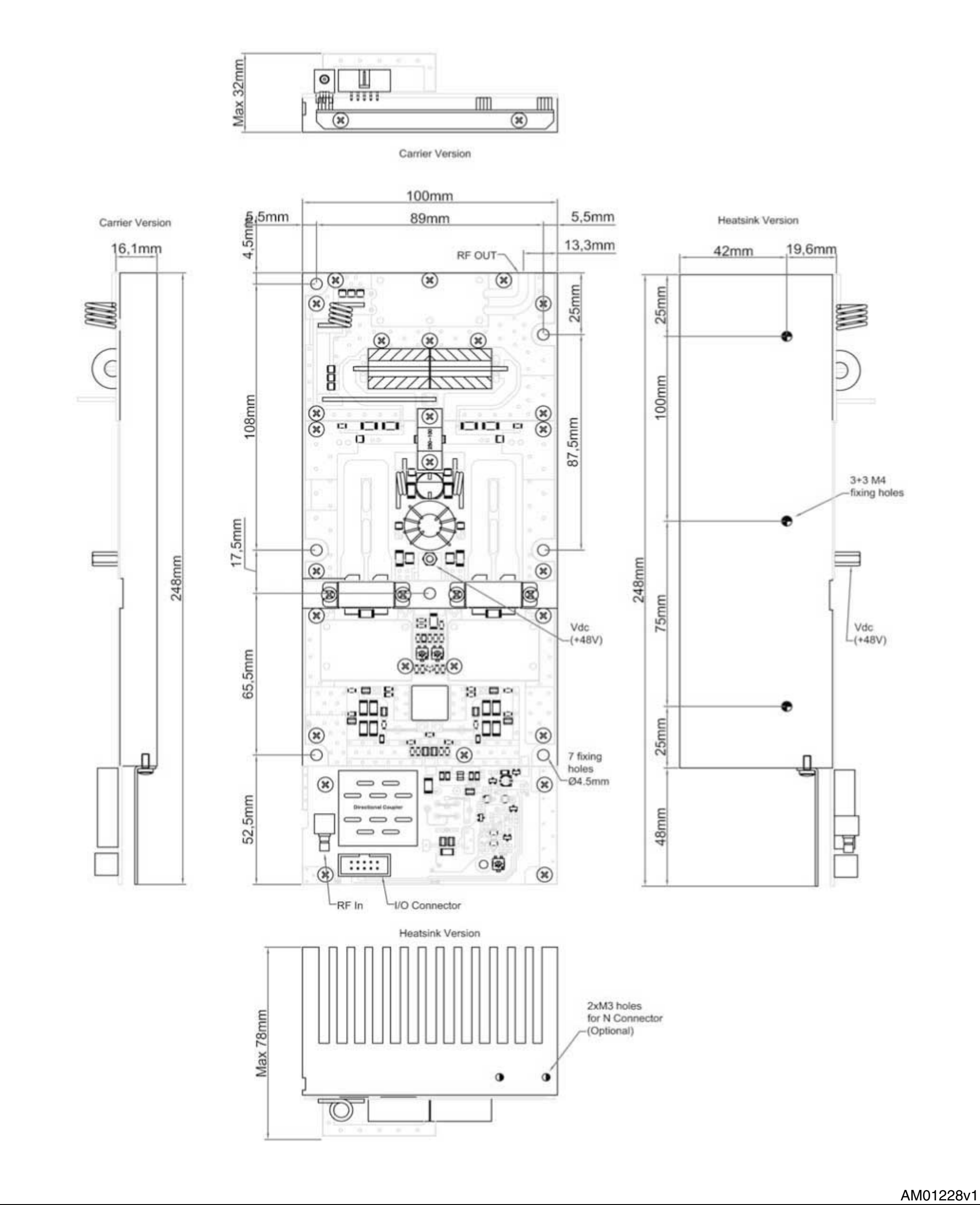


**Figure 3. Output directional coupler**



# 4 Circuit layout and connections

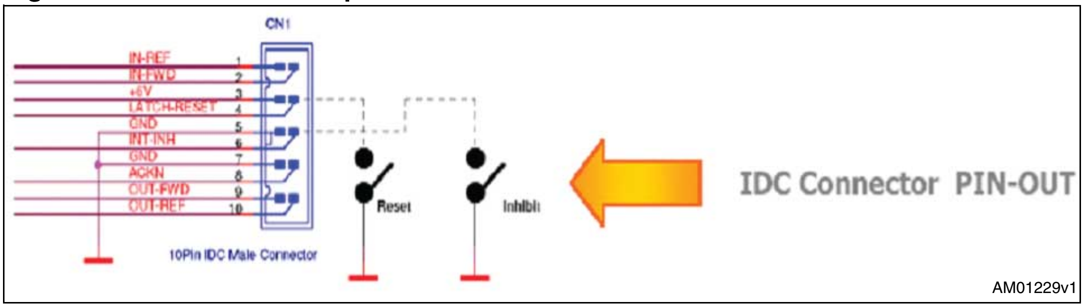
**Figure 4. Circuit layout and connections**



# 5 Features include

- 30 W input dummy load with automatic change-over case of alarm
- Input directional coupler
- Output directional coupler
- Input forward power measurement 2.5 V @ 10 W
- Input reflected power measurement 2.5 V @ 5 W
- Output forward power measurement 2.5 V @ 700 W
- Output reflected power measurement 2.5 V @ 250 W
- Latching protection
- Latch reset pin for manual restart (momentary to GND)
- Over reflected power ultrafast alarm (700 nS)
- Input pin for RF power inhibit
- Acknowledge pin alarm + 5 V

**Figure 5. IDC connector piuout**



# 6 SD2942 mounting recommendations

## 6.1 Mounting recommendations

- Ensure holes in heatsinks are free from burrs;
- Minimum depth of tapped holes in heatsinks is 6 mm;
- Use 4-40 UNC-2A cheese-head screws with a flat washer to spread the joint pressure;
- The minimum flatness of the mounting area is 0.02 mm;
- Mounting area roughness should be less than 0.5 µm (micro);
- Avoid, as much as possible, use of flux or flux solutions because flux can penetrate even when hermetically sealed ceramic-capped transistors. Tin and wash the printed-circuit board BEFORE mounting the power transistors, then solder the transistor leads without using flux;
- Transistor leads may be tinned by dipping them full-length into a solder bath at a temperature of about 230 °C. No flux should be used during tinning;
- Recommended heatsink compounds: WPSII (silicon free) from Austerlitz Electronics, 340 from dow corning etc.

## 6.2 Mounting sequence

- Apply a thin layer of evenly distributed heatsink compound to the flange;
- Position the device with flat washers in place;
- Tighten the screws until finger tight (0.05 Nm);
- Further tighten the screws until the specified torque is reached;
- For M174, M177 and M244 type of packages, torque should be minimum 0.6 Nm and 0.75 Nm max.

**Table 4. DMOS packages - list of materials**

| Package Type | Description | Flange | Leadframe | Ceramic insulator | Plating | | Torque (Nm) | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Leads | Flange | Min | Max |
| M174 | 0.500 dia 4l non herm w/flange | Cu | Alloy 42 (Fe58 / Ni42) | BeO (99.5% min) | Au (100 µ min) over Ni (100 µ min / 350 µ max) | Ni(100 µ min) + Pd (10 µ min) | 0.6 | 0.75 |
| M174 (Moly disk) | 0.500 dia 4l non herm w/flange (moly disk) | Cu-Mo-Cu | Alloy 42 (Fe58 / Ni42) | BeO (99.5% min) | Au (100 µ min) over Ni (100 µ min / 350 µ max) | Ni(100 µ min) + Pd (10 µ min) | 0.6 | 0.75 |
| M177 | 0.550 dia 4l non herm w/flange | Cu-Mo-Cu | Alloy 42 (Fe58 / Ni42) | BeO (99.5% min) | Au (60 µ min) over Ni (100 µ min / 350 µ max) | Au (100 µ min) over Ni (100 µ min / 350µ max) | 0.6 | 0.75 |
| M244 | 2 x 0.400x0.425 wide 2l lap n/h flange | W (85%) - Cu (15%) | Alloy 42 (Fe58 / Ni42) | BeO(99.5 % min) | Au (60 µ min) over Ni (100 µ min / 350µ max) | Au (60 µ min) over Ni (100 µ min / 350µ max) | 0.6 | 0.75 |

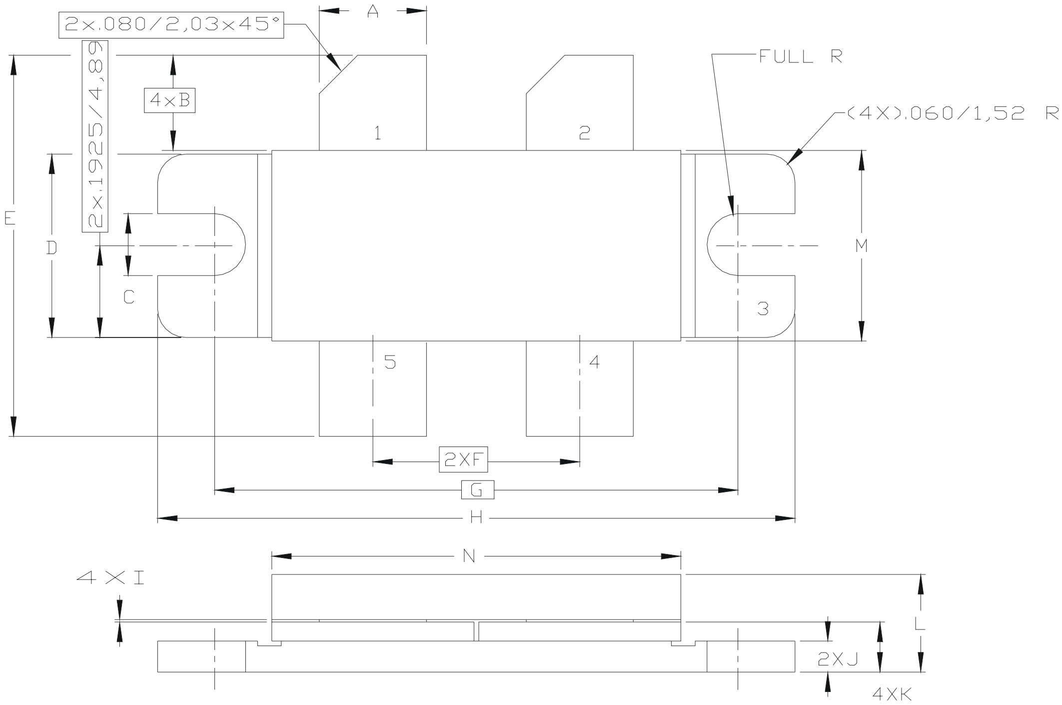
# 7 Package mechanical data:

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

**Table 5. M244 (.400 x .860 4/L BAL N/HERM W/FLG)**

| Dim. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | Min. | Typ | Max. | Min. | Typ | Max. |
| A | 5.59 | | 5.84 | 0.220 | | 0.230 |
| B | | 5.08 | | | 0.200 | |
| C | 3.02 | | 3.28 | 0.119 | | 0.129 |
| D | 9.65 | | 9.91 | 0.380 | | 0.390 |
| E | 19.81 | | 20.82 | 0.780 | | 0.820 |
| F | 10.92 | | 11.18 | 0.430 | | 0.440 |
| G | | 27.94 | | | 1.100 | |
| H | 33.91 | | 34.16 | 1.335 | | 1.345 |
| I | 0.10 | | 0.15 | 0.004 | | 0.006 |
| J | 1.52 | | 1.78 | 0.060 | | 0.070 |
| K | 2.59 | | 2.84 | 0.102 | | 0.112 |
| L | 4.83 | | 5.84 | 0.190 | | 0.230 |
| M | 10.03 | | 10.34 | 0.395 | | 0.407 |
| N | 21.59 | | 22.10 | 0.850 | | 0.870 |

**Figure 6. M244 package dimensions**




Controlling Dimension: Inches

# 8 Revision history

Table 6. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 02-Apr-2010 | 1 | Initial release. |